

CHAPTER 4

EGRESS

SECTION 401 GENERAL

401.1 General. The means of egress for new bleachers, folding and telescopic seating, and grandstands shall comply with this chapter.

SECTION 402 TRAVEL

402.1 Exit access. Travel within tiered seating shall be considered exit access. Exit access includes aisles, cross-aisles, sloped or level walking surfaces, vomitories, tunnels, stairs and ramps connecting the tiered seating structure to other portions of a building, structure or grade.

SECTION 403 OCCUPANT LOAD

403.1 Occupant load. Where bench seating is used, the number of persons shall be based on one person for each 18 inches (457 mm) of length of the bench. Where individual seats are provided, the occupant load shall be based on one person per seat. The occupant load of reviewing stands and press boxes shall be based on 5 square feet (0.465 m²) per person for standing space and 7 square feet (0.65 m²) per person for movable chair seating space. The occupant load for security, audio and camera platforms shall be based on the actual number of occupants.

SECTION 404 GENERAL MEANS OF EGRESS

404.1 Minimum number of exits. The minimum number of exits shall be provided from the seating area based on the following occupant loads and in accordance with the calculated width requirement for egress capacity in Section 404.5.

OCCUPANT LOAD	REQUIRED MEANS OF EGRESS
0-250	1
251-750	2
751- 2,500	3
Over 2,500	4

404.2 Room or space means of egress. Rooms or spaces in which tiered seating is located shall be provided with the required means of egress in accordance with the building code.

404.3 Exterior installations. For exterior installations where the means of egress converges, a minimum of two egress paths shall be provided, sized to accommodate the occupant load served. Where the exit discharge does not lead directly to a street or public way, it shall lead to an area of refuge sized to

contain the full capacity and located a minimum of 50 feet (15 240 mm) from the structure.

404.4 Travel distance. For installations located inside a building, the travel distance from each seat to an exit shall comply with the building code. For exterior installations, the travel distance from each seat to the perimeter of the seating structure shall not exceed 400 feet (122 m). Where aisles are provided for seating, the distance shall be measured along the aisles and aisle accessway without travel over or on the seats.

404.5 Required width. The clear width of aisles and other means of egress for indoor smoke-protected assembly seating shall not be less than the occupant load served by the egress elements multiplied by the appropriate factor in Table 404.5(1). The clear width of aisles and other means of egress for indoor assembly seating that is not smoke protected shall not be less than the occupant load served by the egress elements multiplied by the appropriate factor in Table 404.5(2). The clear width of aisles and other means of egress for outdoor smoke-protected assembly seating shall not be less than the occupant load served by the egress elements multiplied by the appropriate factor in Table 404.5(3). The total number of seats specified shall be those within the space exposed to the same environment.

Aisles shall also comply with Section 405. The clear width shall be measured to walls, edges of seating and tread edges except for permitted projections. There shall be no obstructions in the required width of aisles except for handrails as provided in Section 409.7.

SECTION 405 AISLES

405.1 Aisles. The minimum width of aisles shall be in accordance with Section 404.5, but not less than that required by this section. An aisle is not required in seating facilities where all of the following conditions exist.

1. Seats are without backrests.
2. The rise from row to row does not exceed 6 inches (152 mm) per row.
3. The row spacing does not exceed 28 inches (711 mm) unless the seatboards and footboards are at the same elevation.
4. The number of rows does not exceed 16 rows in height.
5. The first seating board is not more than 12 inches (305 mm) above the ground or floor below or a cross aisle.
6. Seatboards have a continuous flat surface.
7. Seatboards provide a walking surface with a minimum width of 11 inches (279 mm).
8. Egress from seating is not restricted by rails, guards or other obstructions.

**TABLE 404.5(1)
WIDTH OF AISLES AND MEANS OF EGRESS FOR INDOOR SMOKE-PROTECTED ASSEMBLY SEATING**

TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY OCCUPANCY	INCHES OF CLEAR WIDTH PER SEAT SERVED			
	Stairs and aisle steps with handrails within 30 inches	Stairs and aisle steps without handrails within 30 inches	Passageways, doorways and ramps not steeper than in 1:10 slope	Ramps steeper than in 1:10 slope
Equal to or less than 5,000	0.200	0.250	0.150	0.165
10,000	0.130	0.163	0.100	0.110
15,000	0.096	0.120	0.070	0.077
20,000	0.076	0.095	0.056	0.062
Equal to or greater than 25,000	0.060	0.075	0.044	0.048

For SI: 1 inch = 25.4 mm.

Note: Interpolation is permitted between specific values shown.

**TABLE 404.5(2)
WIDTH OF AISLES AND MEANS OF EGRESS
FOR INDOOR NONSMOKE-PROTECTED ASSEMBLY SEATING**

TOTAL NUMBER OF SEATS IN THE NONSMOKE-PROTECTED ASSEMBLY OCCUPANCY	INCHES OF CLEAR WIDTH PER SEAT SERVED			
	Stairs and aisle steps with handrails within 30 inches	Stairs and aisle steps without handrails within 30 inches	Passageways, doorways and ramps not steeper than in 1:10 slope	Ramps steeper than in 1:10 slope
All seating configurations	0.3	0.375	0.2	0.22

For SI: 1 inch = 25.4 mm.

Note: The values in the table are applicable to steps with riser heights of 7 inches and below. Add 0.005 inch of additional stair width for each occupant for each additional 0.10 inch of riser height above 7 inches.

**TABLE 404.5(3)
WIDTH OF AISLES AND MEANS OF EGRESS FOR OUTDOOR SMOKE-PROTECTED ASSEMBLY SEATING**

TOTAL NUMBER OF SEATS IN THE SMOKE-PROTECTED ASSEMBLY OCCUPANCY	INCHES OF CLEAR WIDTH PER SEAT SERVED			
	Stairs and aisle steps with handrails within 30 inches	Stairs and aisle steps without handrails within 30 inches	Passageways, doorways and ramps not steeper than in 1:10 slope	Ramps steeper than in 1:10 slope
Equal to or less than 15,000	0.080	0.080	0.060	0.066
20,000	0.076	0.095	0.056	0.062
Equal to or greater than 25,000	0.060	0.075	0.044	0.048

For SI: 1 inch = 25.4 mm.

Note: Interpolation is permitted between specific values shown.

405.2 Minimum aisle width. The minimum clear width of aisles shall be as follows.

- Forty-eight inches (1219 mm) for aisle stairs having seating on each side.

Exception: Thirty-six inches (914 mm) where the aisle serves less than 50 seats.
- Thirty-six inches (914 mm) for aisle stairs having seating on only one side.
- Twenty-three inches (584 mm) between an aisle stair handrail or guard and seating where the aisle has a mid-aisle handrail.
- Forty-two inches (1067 mm) for level or ramped aisles having seating on both sides.

Exceptions:

- Thirty-six inches (914 mm) where the aisle serves less than 50 seats.
- Thirty inches (762 mm) where the aisle does not serve more than 14 seats.
- Thirty-six inches (914 mm) for level or ramped aisles having seating on only one side.

Exceptions:

- Thirty inches (762 mm) where the aisle does not serve more than 14 seats.
- Twenty-three inches (584 mm) between an aisle stair handrail and seating where an aisle does not serve more than five rows on one side.

405.3 Aisle width. The aisle width shall provide sufficient egress capacity for the number of persons accommodated by the catchment area served by the aisle in accordance with Section 404.5. The catchment area served by an aisle is that portion of the total space that is served by that section of the aisle. In establishing catchment areas, the assumption shall be made that there is a balanced use of all means of egress, with the number of persons in proportion to egress capacity.

405.4 Converging aisles. Where aisles converge to form a single path of egress travel, the required egress capacity of that path shall not be less than the combined required capacity of the converging aisles.

405.5 Uniform width. Those portions of aisles, where egress is possible in either of two directions, shall be uniform in required width.

405.6 Dead ends. The length of a dead-end aisle shall not exceed 16 rows in nonsmoke-protected assembly seating and 21 rows in smoke-protected assembly seating.

Exceptions: Dead-end aisles terminating at a cross aisle or vomitory providing access to an exit at only one end and complying with any one of the following shall be permitted.

- In nonsmoke-protected assembly seating, dead-end aisles exceeding 16 rows are permitted where seats beyond the 16th row are no more than 24 seats from another aisle, measured along a row of seats having an aisle accessway with a minimum clear width of 12 inches (305 mm) plus 0.6

inch (15.2 mm) for each additional seat beyond seven in the row.

- For smoke-protected seating, dead-end aisles exceeding 21 rows are permitted where seats beyond the 21st row are no more than 40 seats from another aisle, measured along a row of seats having an aisle accessway with a minimum clear width of 12 inches (305 mm) plus 0.3 inch (15.2 mm) for each additional seat beyond seven in the row.

405.6.1 Dead-end cross aisles. Dead-end cross aisles shall not exceed 20 feet (6096 mm).

SECTION 406 AISLE STAIRS

406.1 Treads and risers. Aisle stairs shall consist of a series of treads and risers that extend across the full width of the aisle. Aisle stairs shall be constructed in accordance with the requirements of this section.

406.2 Tread depth. Tread depth shall be a minimum of 11 inches (279 mm). The tolerance between adjacent treads shall not exceed 0.188 inch (408 mm).

406.3 Tread construction. Treads constructed of more than two elements shall not have a gap of more than 0.25 inch (6.4 mm) between adjacent tread surfaces. Treads constructed of grating shall not permit a sphere of 0.25 inch (6.4 mm) in diameter to pass through.

406.4 Riser height. Riser height shall be not less than 4 inches (102 mm) nor more than 8 inches (203 mm).

Exception: Riser height not exceeding 9 inches (229 mm) shall be permitted where necessitated by the slope of the adjacent seating areas to maintain sightlines.

406.5 Riser construction. Risers shall be of solid construction.

Exceptions:

- Openings in risers are permitted provided the opening does not exceed 0.5 inches (12.7 mm) in height and width.
- Solid risers are not required in telescopic and folding seating where necessary to maintain opening and closing operational clearances.

406.6 Dimensional uniformity. Stair treads and risers shall be of uniform size and shape. The tolerance between the largest and smallest riser or between the largest and smallest tread shall not exceed 0.375 inch (9.5 mm) in any flight of stairs.

Exception: Treads and risers in transition areas and parabolic seating configurations in accordance with Section 406.6.1.

406.6.1 Tread and riser nonuniformity permitted. Treads and risers located in transition areas between adjacent tiered seating elements, parabolic seating configurations or onto or off of tiered seating are not required to be of uniform depth or height where a mid-aisle handrail is provided. The handrail shall meet the requirements of Section 409. Mid-aisle handrails

in transition areas shall extend the full length of the transition and a minimum of one tread depth, parallel to the run of the aisle stairs, above and below the uppermost and lowermost riser in the transition. Where extensions of the aisle handrail interfere with adjacent means of egress, the handrail extension shall terminate at the riser.

406.6.2 Tread marking stripe. Where tread or riser nonuniformity exceeds 0.188 inch (4.8 mm), a distinctive marking stripe shall be provided on each tread adjacent to the nonuniform tread or riser. The marking shall be provided on each tread at the nosing or leading edge such that the location of each tread is readily apparent when viewed in descent. Such stripe shall be a minimum of 1 inch (25 mm) wide and a maximum of 3 inches (76 mm) wide.

Exception: The contrasting marking stripe is permitted to be omitted where tread surfaces are such that the location of each tread is readily apparent when viewed in descent.

SECTION 407 AISLE ACCESSWAYS

407.1 Required aisle accessways. Aisle accessways shall be provided above the first row of seating. Aisle accessways located more than 30 inches (762 mm) above the floor or ground below shall be constructed such that openings shall not allow the passage of a sphere greater than 4 inches (102 mm) in diameter. Where bleacher-type seating is utilized, such seats shall be a minimum depth of 9 inches (229 mm).

407.2 Minimum width. Where seating rows have 14 or fewer seats, the minimum clear aisle accessway width shall not be less than 12 inches (305 mm) measured as the clear horizontal distance from the back of the row ahead and the nearest projection of the row behind. Where chairs have automatic or self-rising seats, the measurement shall be made with seats in the raised position. Where any chair in the row does not have an automatic or self-rising seat, the measurements shall be made with the seat in the down position. For seats with folding tablet arms, row spacing shall be determined with the tablet arm down.

407.3 Dual access. For rows of seating served by aisles or doorways at both ends, there shall not be more than 100 seats per row. The minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.3 inch (7.6 mm) for every additional seat beyond 14, but the minimum clear width is not required to exceed 22 inches (559 mm).

Exceptions:

1. For smoke-protected assembly seating, the row length limits for a 12-inch-wide (305 mm) aisle accessway, beyond which the aisle accessway minimum clear width shall be increased in accordance with Section 407.5.
2. Where seats are without backrests, 21 seats between aisles shall be permitted with a minimum clear width of 12 inches (305 mm).

407.4 Single access. For rows of seating served by an aisle or doorway at only one end of the row, the minimum clear width of 12 inches (305 mm) between rows shall be increased by 0.6 inch (15.2 mm) for every additional seat beyond seven seats,

but the minimum clear width is not required to exceed 22 inches (559 mm). The path of egress travel, however, shall not exceed 30 feet (9144 mm) from any seat to a point where a person has a choice of two paths of egress travel to two exits. Where one of the two paths of travel is across the aisle through a row of seats to another aisle, there shall not be more than 24 seats between the two aisles; and the minimum clear width between rows for the row between the two aisles shall be 12 inches (305 mm) plus 0.6 inch (15.2 mm) for each additional seat above seven in the row between aisles.

Exceptions:

1. For smoke-protected assembly seating, the row length limits for a 12-inch-wide (305 mm) aisle accessway, beyond which the aisle accessway minimum clear width shall be increased, are in Table 407.5.
2. Where seats are without backrests, a maximum of 10 seats to an aisle shall be permitted with a minimum clear width of 12 inches (305 mm).
3. In smoke-protected assembly seating, the path of egress travel shall not exceed 50 feet (15 240 mm) from any seat to a point where a person has a choice of two paths of egress travel to two exits.

407.5 Smoke-protected aisle accessways. The design of smoke-protected aisle accessways shall comply with Table 407.5.

SECTION 408 GUARDS

408.1 Required guards. Guards shall be provided in the following areas.

1. Along open-sided walking surfaces, cross aisles, stepped aisles, ramps and landings of tiered seating areas which are located more than 30 inches (762 mm) above the floor or grade below. Such guards shall be not less than 42 inches (1067 mm) high, measured vertically above the leading edge of the tread, adjacent walking surface or adjacent bench seat.

Exception: A guard is not required where the tiered seating is located adjacent to a wall and the space between the wall and the tiered seating is less than 4 inches (102 mm).

2. Where an elevation change of 30 inches (762 mm) or less occurs between a cross aisle and the adjacent floor or grade below, guards not less than 26 inches (660 mm) above the aisle floor shall be provided.

Exception: Where the backs of seats on the front of the cross aisle project 24 inches (610 mm) or more above the adjacent floor of the aisle, a guard need not be provided.

3. A guard shall be provided for the full width of an aisle where the lowest point of the aisle is more than 30 inches (762 mm) above the floor or ground below. The guard shall be a minimum of 36 inches (914 mm) high and shall provide a minimum 42 inches (1067 mm) measured

**TABLE 407.5
SMOKE-PROTECTED AISLE ACCESSWAYS**

TOTAL NUMBER OF SEATS IN THE SMOKE PROTECTED ASSEMBLY OCCUPANCY	MAXIMUM NUMBER OF SEATS PER ROW PERMITTED TO HAVE A MINIMUM 12-INCH CLEAR WIDTH AISLE ACCESSWAY	
	Aisle or doorway at both ends of row	Aisle or doorway at one end of row only
Less than 4,000	14	7
4,000	15	7
7,000	16	8
10,000	17	8
13,000	18	9
16,000	19	9
19,000	20	10
22,000 and greater	21	11

For SI: 1 inch = 25.4 mm.

diagonally between the top of the rail and the nosing of the nearest aisle step.

- Unless subject to the requirements of Item 3, a guard with a minimum height of 26 inches (660 mm) shall be provided where the floor or footboard elevation is more than 30 inches (762 mm) above the floor or grade below and the guard would otherwise interfere with the sightlines of immediately adjacent seating.

408.2 Opening limitations. Open guards shall be constructed of materials such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 34 inches (864 mm). From a height of 34 inches (864 mm) to 42 inches (1067 mm) above the adjacent walking surfaces, a sphere 8 inches (203 mm) in diameter shall not pass.

Exceptions:

- The triangular opening formed by the riser, tread and bottom rail at the open side of an aisle stair or tiered seating shall be of a maximum size such that a sphere of 6 inches (152 mm) in diameter cannot pass through the opening.
- Guards at the end of aisles where they terminate at a fascia of boxes, balconies and galleries shall have balusters or ornamental patterns such that a 4-inch-diameter (102 mm) sphere cannot pass through any opening up to a height of 26 inches (660 mm). From a height of 26 inches (660 mm) or greater above the adjacent walking surfaces, a sphere 8 inches (203 mm) in diameter shall not pass.
- The opening limitation shall not apply to guards required in accordance with Item 2 of Section 408.1.

408.3 Guard design. Guards and their attachment shall be designed to resist the loads indicated in Section 303.

**SECTION 409
HANDRAILS**

409.1 Required handrails. Where seats are located on both sides of an aisle stair, a minimum of one mid-aisle handrail shall be provided. Where seats are located on one side of an aisle stair, a minimum of one handrail shall be provided on the side of the stair where there are no seats.

Exception: A handrail is not required for an aisle stair serving a single row of seating.

409.1.1 Mid-aisle handrails. Where there is seating on both sides of the aisle, the mid-aisle handrails shall be discontinuous with gaps or breaks at intervals not exceeding five rows to facilitate access to seating and permit crossing from one side of the aisle to the other. These gaps or breaks shall have a clear width of at least 22 inches (559 mm) and not greater than 36 inches (914 mm), measured horizontally, and the handrail shall have rounded terminations or bends. Such discontinuities shall also be permitted where there is seating on one or both sides of the aisle, and where there are guardrails complying with the graspability requirements for handrails. An additional rail shall be provided below the handrail, located parallel to, and approximately 12 inches (305 mm) below, the handrail. The additional rail need not comply with the graspability provisions of Section 409.3.

409.2 Height. Handrail height, measured above aisle stair tread nosings, shall be uniform, not less than 34 inches (864 mm) and not more than 38 inches (965 mm).

409.3 Graspability. Handrails with a circular cross section shall have an outside diameter of at least 1.25 inches (32 mm) and not greater than 2 inches (51 mm) or shall provide equivalent graspability. If the handrail is not circular, it shall have a

perimeter dimension of at least 4 inches (102 mm) and not greater than 6.25 inches (159 mm) with a maximum cross-section dimension of 2.25 inches (57 mm). Edges shall have a minimum radius of 0.01 inch (3.2 mm).

409.4 Continuity. Handrail-gripping surfaces shall be continuous, without interruption by newel posts or other obstructions.

Exceptions:

1. Mid-aisle handrails in accordance with Section 409.1.1.
2. Handrail brackets or balusters attached to the bottom surface of the handrail that do not project horizontally beyond the sides of the handrail within 1.5 inches (38 mm) of the bottom of the handrail shall not be considered to be obstructions.

409.5 Handrail termination. Handrails located on the side of an aisle stair shall return to a wall, guard or the walking surface or shall be continuous to the handrail of an adjacent aisle stair flight.

409.5.1 Mid-aisle handrail termination. Mid-aisle handrails shall not extend beyond the lowest riser and shall terminate within 30 inches (762 mm), measured horizontally, from the face of the lowest riser. Handrail extensions are not required.

409.6 Clearance. Clear space between a handrail and a wall or other surface shall be a minimum of 1.5 inches (38 mm). A handrail and a wall or other surface adjacent to the handrail shall be free of any sharp or abrasive elements.

409.7 Projections. Projections into the required width at each handrail shall not exceed 4.5 inches (11.4 mm) at or below the handrail height.

409.8 Handrail design. Handrails and their attachment shall be designed to resist the loads indicated in Section 303.